MKE PFAS Surface Water Sampling Update, October 2019

Introduction

The Wisconsin Department of Natural Resources Wisconsin Pollution Discharge Elimination System (WPDES) monitoring permit for Milwaukee Mitchell International Airport (MKE) is in the process of being reviewed for renewal. As part of that process, MKE was asked to conduct an initial characterization of the presence of per-and polyfluoroalkyl substances (PFAS) in MKE surface water discharges. Results of these sampling events are provided below.

Site selection

Sites have been chosen to characterize surface water leaving the airport, surface water entering the airport, and several sites within the airport to provide information on contributions and assist in potential source identification (Figures 1 - 3). The primary surface water discharge points at MKE occur at three outfall locations (Table 1, Figures 1). OUT1 drains the air-cargo area, including the runway 7-R deicing ramp. This storm sewer culvert ultimately discharges to Holmes Ave Creek which is a tributary of Wilson Park Creek. OUT7 (Wilson Park Creek) drains the primary terminal area, a substantial amount of runway and taxiway, and the West deicing ramp. The upper portion of the Out7 watershed drains an area upstream from MKE (referred to as IN), including runoff from the Wisconsin Air National Guard 128th refueling wing (referred to as IN-S) and a stormwater system draining the neighborhood east of the airport that includes residential, commercial, and industrial land use (referred to as IN-E). OUT3 drains the southern portion of the runway and taxiway system, the south deicing ramp, the former Air Force Reserve 440th Airlift Wing area, and a small urban area upstream from the airport that includes residential, commercial, and industrial land use. All other sites help to characterize contributions in different areas within the airport and upstream from the airport.

Table 1. Surface water monitoring sites for per- and polyfluoroalkyl substances at Milwaukee Mitchell International Airport.

Site name	USGS site ID	Short site name	Drainage area
Holmes Ave Creek tributary at GMIA Outfall #1 at Milwaukee, WI	040871476	OUT1	0.03
Wilson Park Creek at GMIA Outfall #7 at Milwaukee, WI	040871475	OUT7	2.25
Wilson Park Creek at GMIA Infall at Milwaukee, WI	040871473	IN	0.89
Wilson Park Creek upstream from GMIA Infall at Milwaukee, WI	NE	IN-E	ND
Wilson Park Creek tribitary near GMIA Infall at Milwaukee, WI	NE	IN-S	ND
Oak Creek tributary at College Ave at Milwaukee, WI	040872015	OUT3	1.76
Oak Creek tributary upstream from GMIA at Milwaukee, WI	NE	OUT3-US	ND
Oak Creek tributary upstream from runway 7-R at Milwaukee, WI	NE	OUT3-440	ND
Oak Creek tributary downstrem from GMIA runway 7-R at Milwaukee, WI	NE	OUT3-1LE	ND
Open channel tributary to Oak Creek tributary along College Ave at Milwaukee, WI	NE	OUT3-SDD	ND

ND, drainage area not yet determined; NE, USGS site ID not yet established.

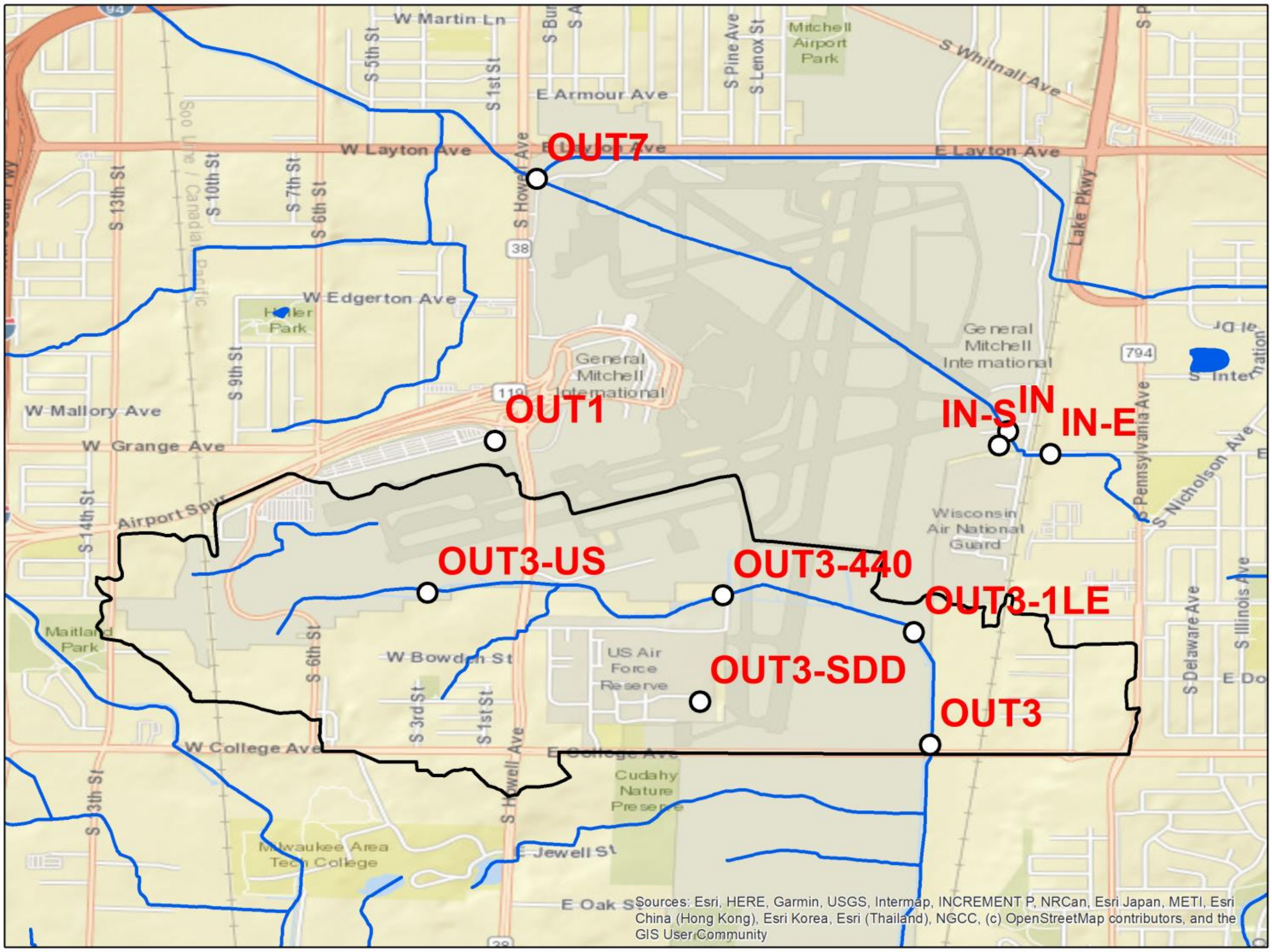

Figure 1: Map of surface water sampling sites for per- and polyfluoroalkyl substances at Milwaukee Mitchell International Airport.

Figure 2: Map of surface water sites in the Wilson Park Creek Watershed on the East portion of airport property sampled for per- and polyfluoroalkyl substances at Milwaukee Mitchell International Airport.

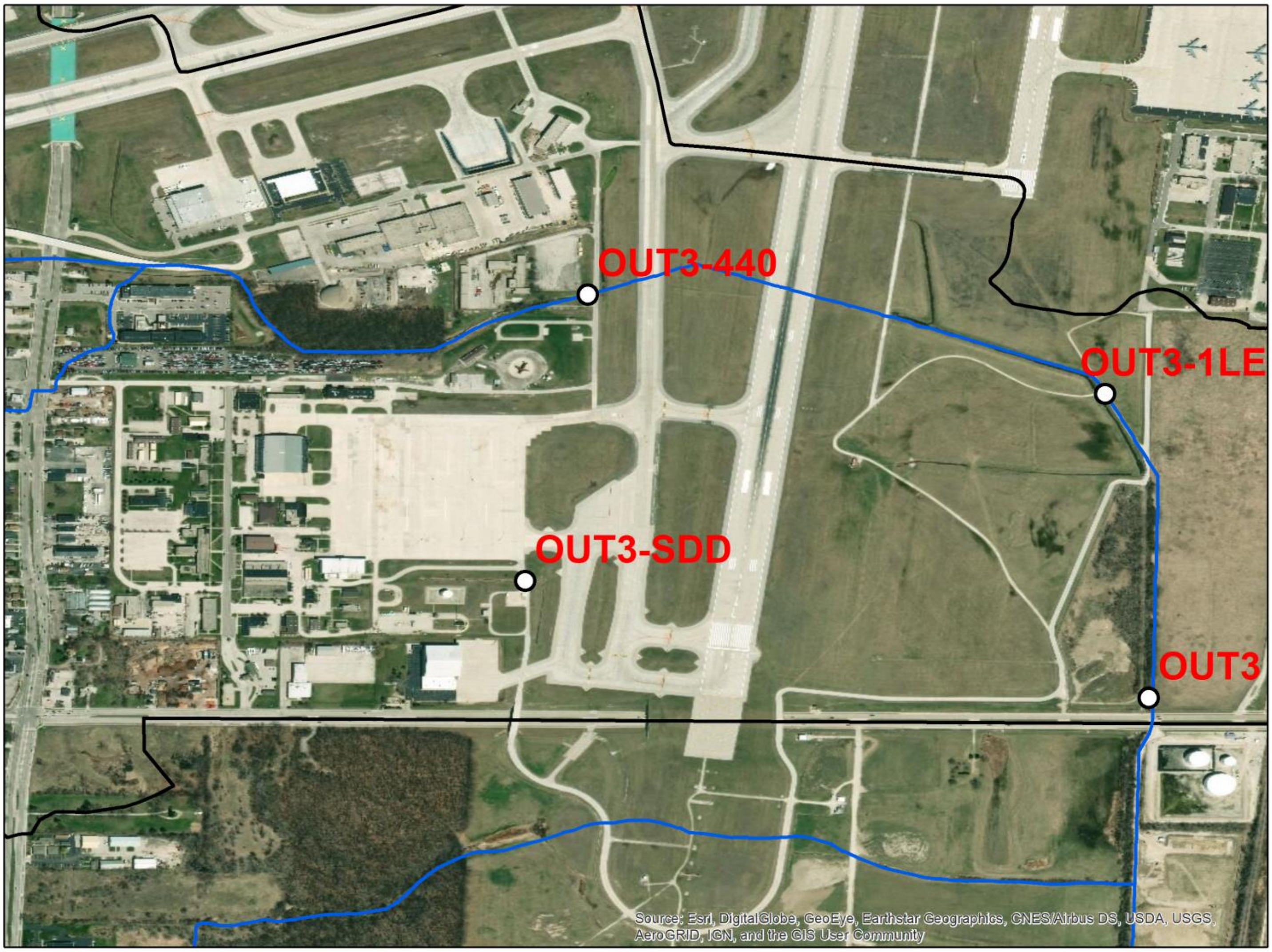

Figure 3: Map of surface water sites in the Oak Creek Watershed sampled for per- and polyfluoroalkyl substances at Milwaukee Mitchell International Airport.

Sampling

Sampling was conducted during two low-flow periods and one high-flow period that resulted from rainfall . In the first low-flow period, six sites were sampled. In the second low-flow period, nine sites were sampled, and all ten sites were sampled during the high-flow period (Figures 4 - 6). Samples were not colleced at OUT1 during low-flow because the culvert was without flow. Flow was measured for each sample collected and used in computation of mass loadings.

Samples were analyzed by the Wisconsin State Laboratory of Hygiene using EPA method 537.1.

Results

Concentrations:

Bar graphs with results from PFAS sampling at MKE indicate variable concentrations by site (Figures 4 - 6). Low-flow sampling periods indicate that PFAS concentrations increased from the upstream sites (OUT3-US, IN-E) to sites within and at the exit from the airport. Concentrations are valuable for assessing each individual site, but not necessarily useful for comparing contributions to the streams. Mass loadings are necessary for these comparisons (see below).

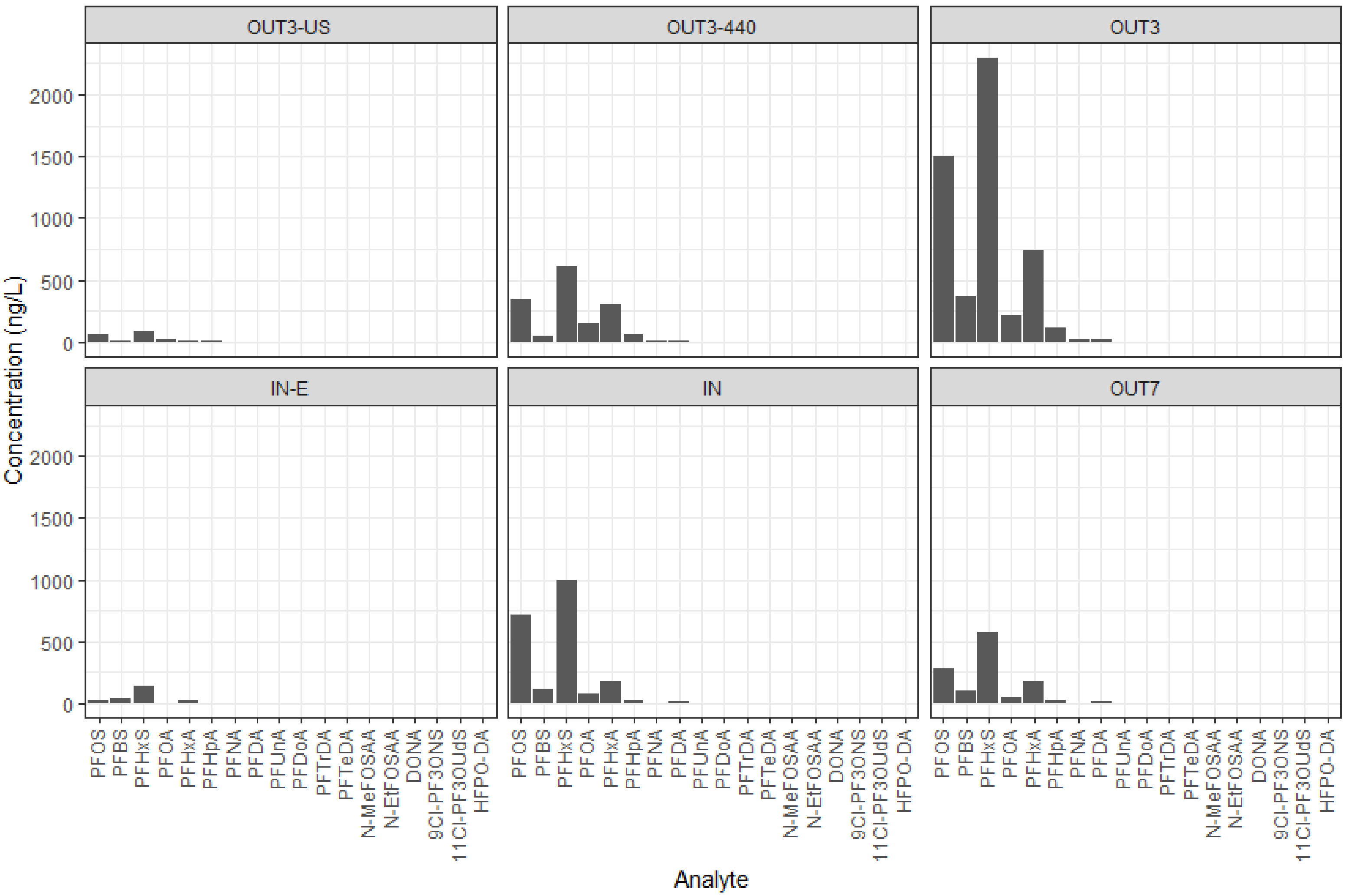

Figure 4: PFAS concentrations for low-flow sampling period, April 24, 2019. ng/L, nanograms per liter.

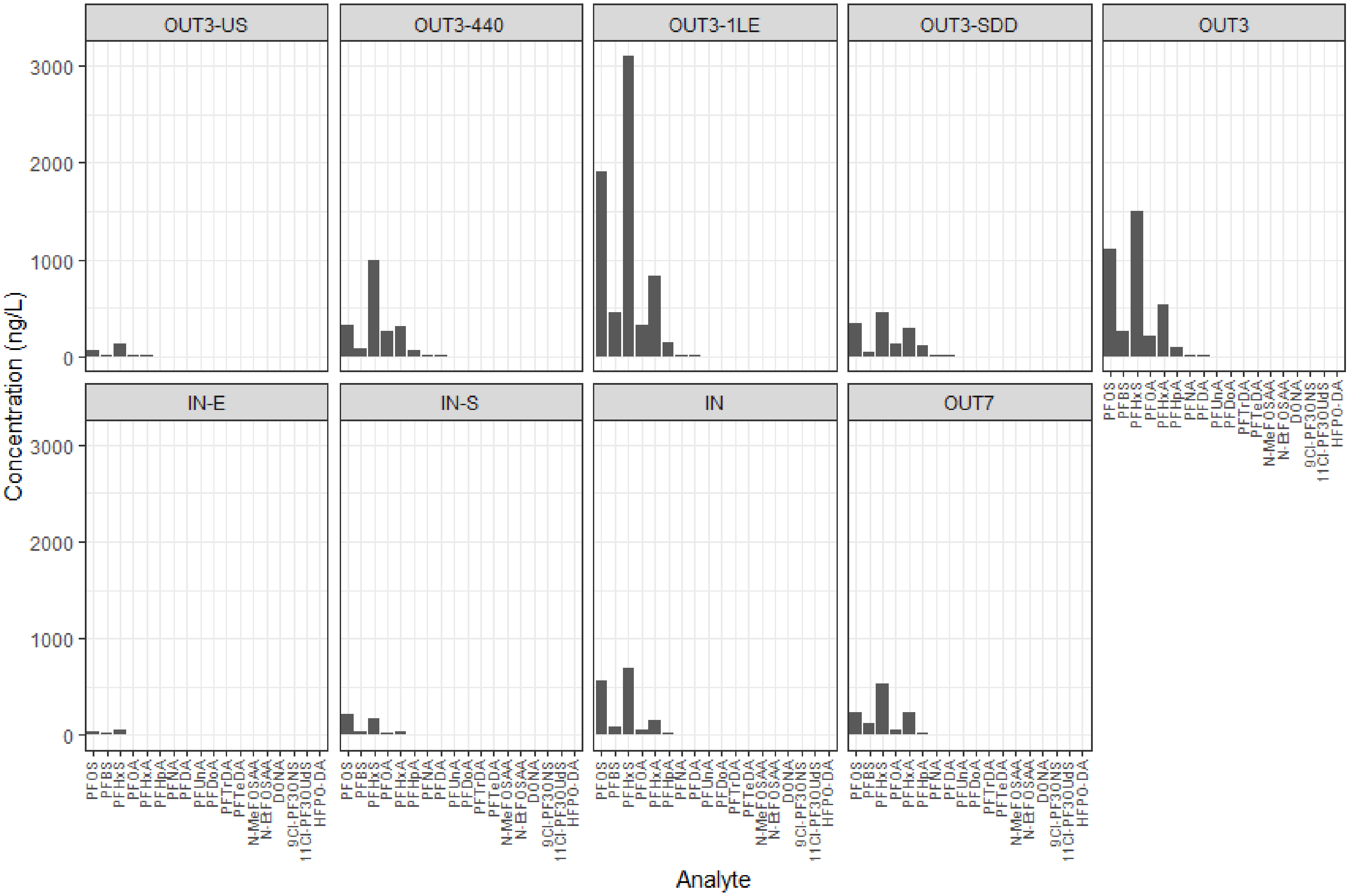

Figure 5: PFAS concentrations for low-flow sampling period, May 24, 2019. ng/L, nanograms per liter.

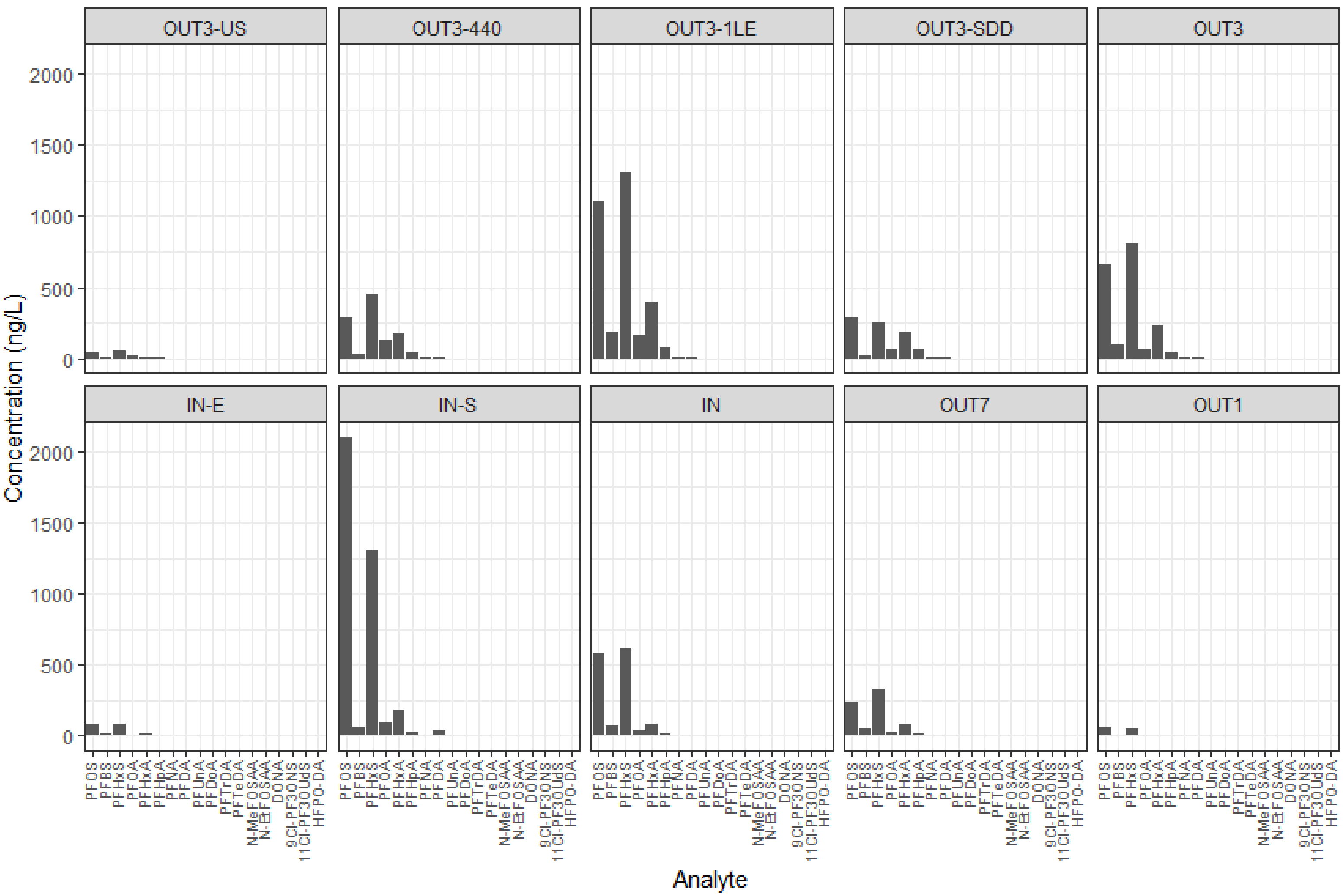

Figure 6: PFAS concentrations for the event-flow sampling period, June 3, 2019. ng/L, nanograms per liter.

Loadings:

Mass loadings are provided to facilitate comparison among contributions from individual sites (Figures 7 - 9). This comparison provides valuable information except for the OUT7 sample during the high-flow period because there was substantial rain and increased flow between the time when the IN sample was collected and when the OUT7 sample was collected. For this reason, loadings cannot be used to compare contributions between IN and OUT7 during the high-flow event. In addition, caution must be used in overinterpretation of loading data. Loadings rely on accurate flow measurements. For a few sites, velocities were very low and uncertainty is quite high in these instances. Loadings are computed by multiplying concentration with load, so the uncertainty in flow is passed on to loading numbers. An example of this uncertainty is in the Oak creek drainage during the second low-flow sampling period. While it looks like loadings are greater at site OUT3-LE than they are downstream at OUT3, this result has potential to be an artifact of flow uncertainty. It is possible that the loadings really did not decrease going downstream. On the other hand, there is a ponded area where deposition of sediments could occur that may potentially remove PFAS content in the water column between those two sites.

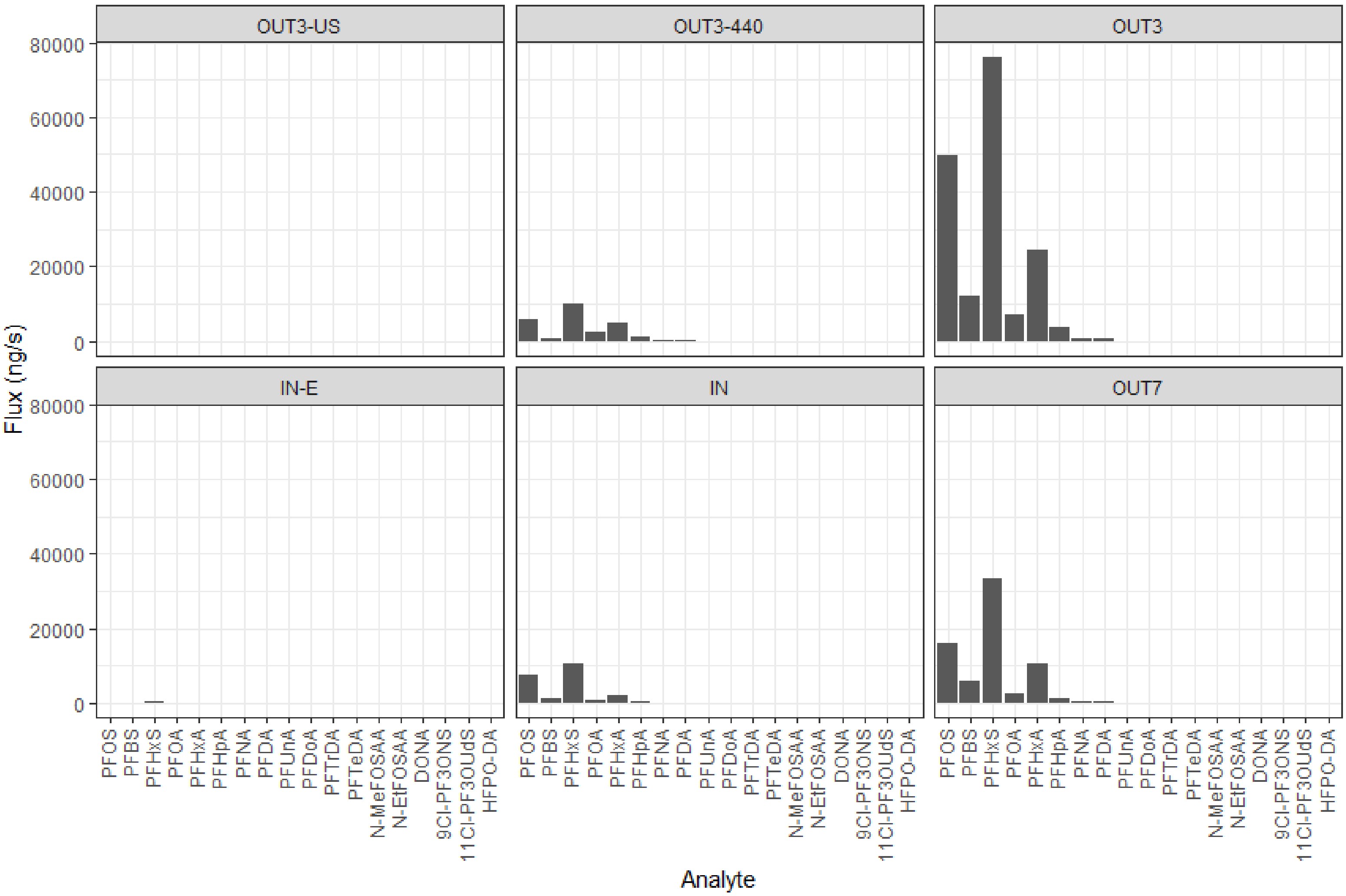

Figure 7: PFAS loadings for low-flow sampling period, April 24, 2019. ng/s, nanograms per second.

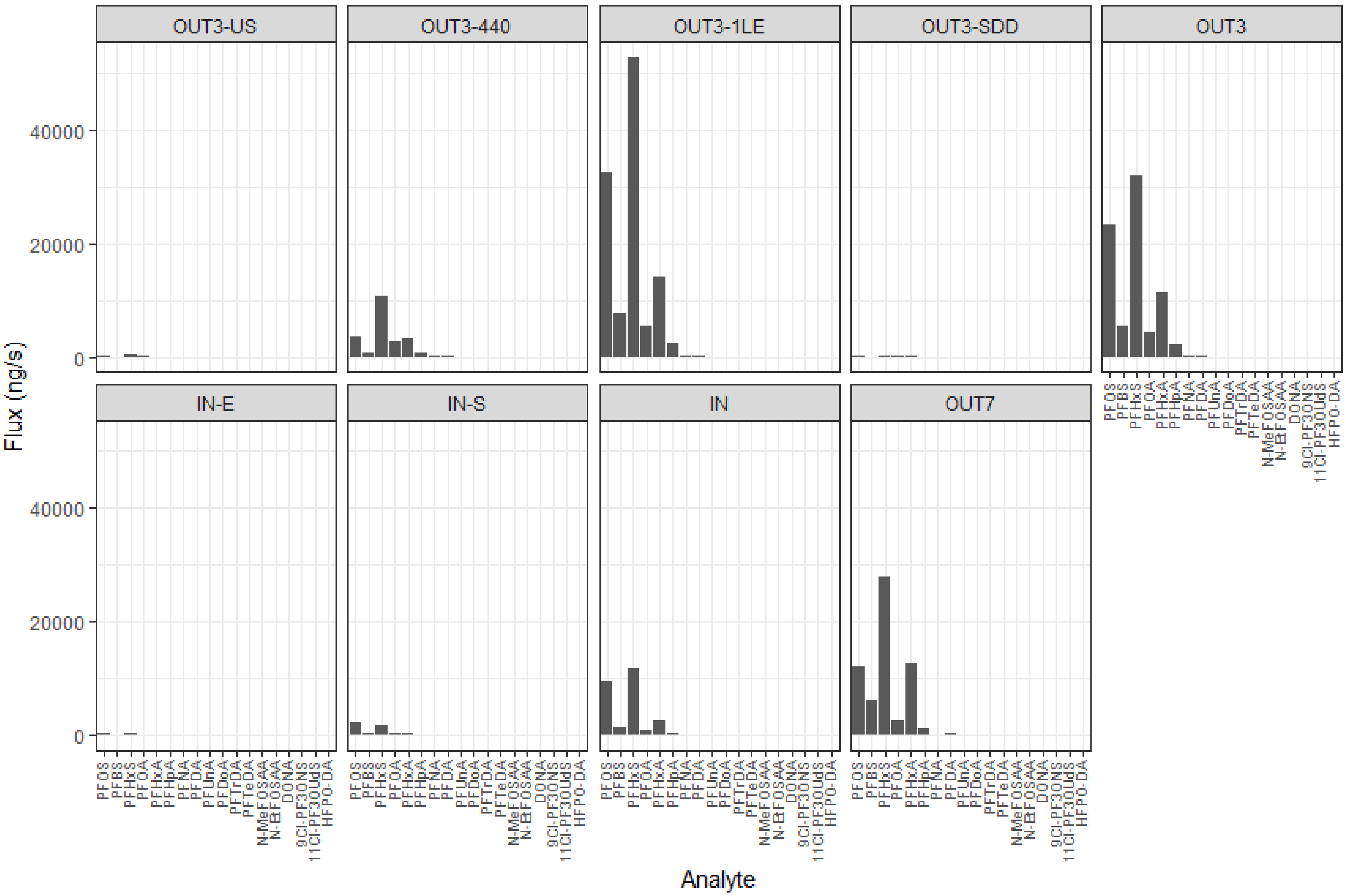

Figure 8: PFAS loadings for low-flow sampling, May 24, 2019. ng/s, nanograms per second.

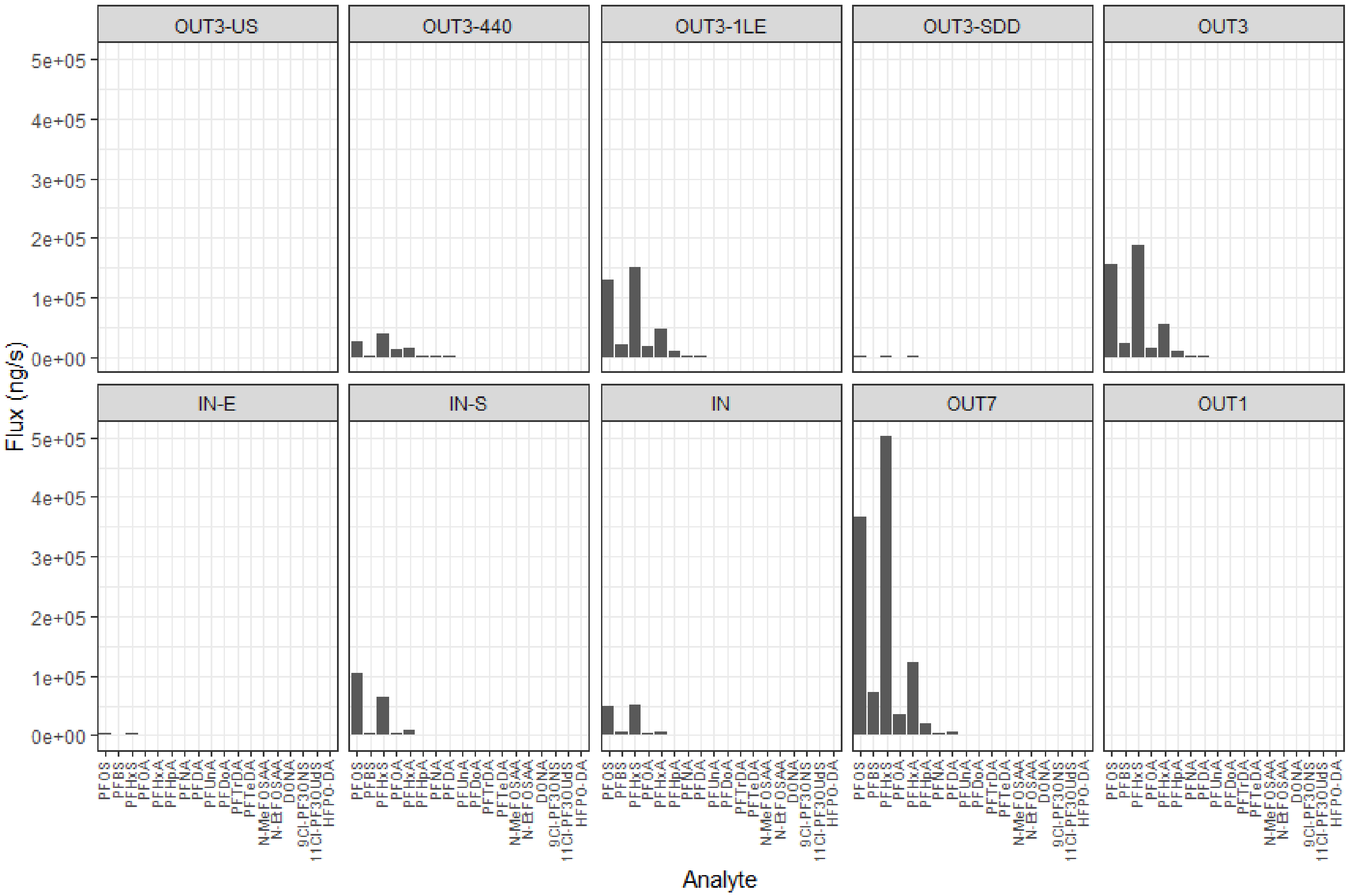

Figure 9: PFAS loadings for the high-flow sampling period, June 3, 2019. ng/s, nanograms per second.

Low-flow samples: Loadings from low-flow sampling results in the Wilson Park Creek watershed indicate substantial contributions between the upstream site at IN-E to site IN and another increase from IN to OUT7. Loadings from low-flow sampling results in the Oak Creek watershed indicate that contributions increase in the downstream direction from the upstream site, OUT3-US to OUT3-1LE with a slight decrease to OUT3.

High-flow samples: Loadings from high-flow sampling results in the Wilson Park Creek watershed indicate substantial contributions between the upstream site at IN-E to site IN. As mentioned above, the OUT7 loadings cannot be compared with IN loadings due to additional rainfall before sampling at OUT7. The relative contribution from IN-S increased during runoff conditions, indicating a potential storage area that may be mobilized during runoff periods.

Loadings from high-flow sampling results in the Oak Creek watershed indicate that contributions increase in the downstream direction from the upstream site, OUT3-US to OUT3-1LE and also an increase between OUT3-1LE to OUT3. The largest contributions are somewhere between Out2-440 and OUT3-1LE. These contributions could originate either from the north through groundwater discharge to the stream, the small channel entering from the north, or these contributions could partially come from groundwater discharge from the area between the creek and the runway on the south side.

The original data is also included as an excel file.